

ART. X.—*New or Little-known Victorian Fossils in the
National Museum.*

PART X.—SOME PALAEOZOIC WORMS AND CRUSTACEA.

BY FREDERICK CHAPMAN, A.L.S., &c.,

National Museum.

(With Plates XXVII., XXVIII., XXIX.).

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Preliminary Remarks.—The present paper relates to a short series of fossils from the Silurian beds in the neighbourhood of Melbourne. The fossils described are the following:—

Trachyderma crassituba, sp. nov.

„ cf. *squamosa*, Phillips.

Turrilepas ornatus, sp. nov.

„ *yingingiae*, sp. nov.

Ceratiocaris pinguis, sp. nov.

„ cf. *pardoeana*, Jones and Woodward.

Xiphidiocaris falcata, sp. nov.

Hitherto, no remains of *Trachyderma* seem to have been recorded from Australia. The genus, however, is well known in the English Ludlow fauna, and has lately been collected from the Silurian of Burma, in beds containing an assemblage of fossils strikingly similar to the Silurian of this State.

Turrilepas has already been described by Mr. Etheridge, junr., from the Bowning beds of New South Wales, and it is therefore of exceptional interest to find their remains in the Victorian Silurian, where they occur in both the Melbournian and Yeringian series.

The commonest genus of the “pod-shrimps,” *Ceratiocaris*, is a fairly abundant fossil in the mudstones and shales of South Yarra (exposed in the Yarra Improvement Works), but owing to the irregular fracture and soft texture of the rock it is very

difficult to secure good specimens for description. The numerous carbonaceous nodules and twig-like remains found there are to be generally attributed to that genus; the former representing the internal casts of the carapace, the latter the abdominal segments, the telson and lateral spines.

One of the most important fossils noticed here is *Xiphidiocaris*, a generic type whose species was first described by Salter, and later by Jones and Woodward under the name of *Xiphocaris*. It has hitherto been collected only from the Lower Ludlow beds of England, where it is exceedingly rare. It appears to be related to the ceratiocarids.

(?) VERMES-ERRANTIA.

Genus—*Trachyderma*, Phillips.

This genus was founded to include some more or less problematic fossils which occur in the Ordovician (Caradoc beds) and the Silurian (Woolhope Limestone and Upper Ludlow) in England. In his original description¹ John Phillips says: "It may be ranked among Serpulidae, having a membranous covering, and a remarkable, though not quite regular, alternation (due, perhaps, to a peculiar spirality) of the successive laminae of growth. There are, however, some appearances in the specimens of *T. coriacea*, which may possibly be adduced in favour of a reference of this fossil to a different group of Annelida."

Good examples, referable to the above genus, occur very frequently in the sandy mudstones of the Melbournian division of the Silurian, particularly near Melbourne, and also sparingly in the mudstones of later Yeringian age in the Upper Yarra district. The additional evidence of structure and habit furnished by some of the specimens now described, shows that the tubular lining or strengthening secretion of the walls of the burrow may have been, in at least one of the Australian species, partially calcified, or possibly of the nature of a mud tube similar to that made by the polynoids of the present day. The

¹ Mem. Geol. Surv. Gt. Brit., vol. ii., pt. i., 1848, p. 331.

majority of the Victorian fossils of the above genus belong to a type characterised by a tubular covering thicker than that in the English examples, in which the tubes were typically membranous and thin. That these fossils may with good reason be regarded as the crypts of burrowing worms, is shown by the form and disposition of the tubes in the surrounding matrix, which, with their solid infillings, traverse the bedding planes at all angles, but are usually inclined from 20-45 deg. Several specimens have been collected by Mr. Spry which show a vertical direction of the tube at the commencement, but soon after change to the oblique position, and continue meandering for some distance; the longest specimen found, up to the present, measuring a little more than 10 cm. This habit of passing downwards through layers of the soft black or grey mud (shale), suggests an affinity with the burrows of such of the polychaetes which secrete a parchment-like tube. Any reference to the sedentary worms, like the Serpulidae, as suggested by Phillips, is untenable, since the buried tip or termination is completely and evenly rounded, as shown in Plate XXIX., Fig. 1; whilst the sides of the tubes are often irregularly and quite suddenly constricted, instead of gently tapering, as in most so-called sedentary forms.

Trachyderma crassituba, sp. nov.

(Pl. XXVII., Figs. 1a, 1b, 2, 3, ?(4); Pl. XXIX., Fig. 1).

Description.—Tube comparatively thick. Near the entrance, the burrow is usually quite cylindrical, but becomes elliptical in section in its oblique course through the shaley mudstone; long and slightly tapering, with rounded extremity. Externally the tube is marked with coarse corrugations or annuli. Internal surface of tube and casts of the interior are closely ornamented with annulate striae, sometimes disposed obliquely and often imbricated. Sides of tube bulging at intervals; occasionally the whole tube is arcuately bent. Interior of tube filled with a solid core of hard mud, frequently arenaceous, and stained with carbonaceous or organic matter.

Dimensions.—Length of tube in the holotype, cir. 100 mm.; width, 16 mm.; thickness of tube, cir. 4 mm.

Occurrence.—Abundant in the Silurian (Melbournian) of the Yarra Improvement Works, South Yarra. Coll. by F. P. Spry and the writer.

Affinities.—*T. crassituba* seems most nearly allied with *T. squamosa*, Phillips,¹ but differs in the thicker and consequently more rigid tube. The English specimens of *T. squamosa* were found at two different horizons in the Silurian, viz., the Woolhope Limestone and the Upper Ludlow beds.²

Remarks.—Many less perfect specimens of *Trachyderma* have been found at South Yarra, which, although apparently referable to *T. crassituba*, show only a stain around the core, as if the wall of the tube had been dissolved away (see Fig. 4). In others the tube is still existent, but nearly of the same substance as the surrounding shale, although of harder texture, so that a fracture in the right direction reveals its tubular nature. The cores or infillings of the burrows show a tendency to crack into short joints, owing to differential shrinkage. It is evident that the departure from the circular section in the contour of the tube is due to pressure of the superposed layers of hardened mud, for the nearer the burrow to the horizontal position, the more compressed does it tend to become. This points to the inevitable conclusion that the tube, however thick it may have been, was always more or less membranous and compressible.

Trachyderma cf. *squamosa*, Phillips.

(Pl. XXVII., Fig. 5).

T. squamosa, Phillips, 1848, Mem. Geol. Surv. Gt. Brit., vol. ii., pt. 1, p. 332, pl. iv. figs. 3, 4.

Remarks.—An example of *Trachyderma*, which does not show the thick tube of the Melbournian specimens, occurs at another horizon, the Yeringian. In this specimen there are some traces of the plaits and fine striae of Phillips' species, so that we may provisionally refer it to that form. The tube passes at an oblique angle into the shale bed, and is elliptical in section.

¹ Mem. Geol. Surv. Gt. Brit., vol. ii., pt. i., 1848, p. 332, pl. iv., figs. 3, 4.

² Fossils of the British Islands, Etheridge, R., vol. i., Palaeozoic, 1888, p. 37.

The specimen here figured measures 27 mm. in length, and its greatest width is 6 mm.

It is of much interest to note that Mr. Cowper Reed has already identified a form of *Trachyderma*, which he provisionally refers to the above species, in the Silurian (Zebingyi Beds) of Burma.¹

Occurrence.—Silurian (Yeringian). In olive brown mudstone, Geol. Surv., Vic. coll. B23, at junction of the Woori Yallock and Yarra. Also a doubtful specimen, in grey shale, of the same series from View Hill Creek, near Yering; Geol. Surv. Vict., coll. B14.

Class, CRUSTACEA. Super-order, CIRRIPIEDIA.

Turrilepas, H Woodward.

Turrilepas ornatus, sp. nov.

(Pl. XXVII., Fig. 1; Pl. XXIX., Fig. 2).

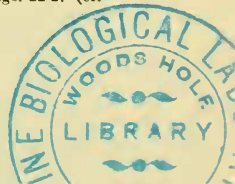
Description.—The characters of this species are based on two plates from different localities, in the same division of the Silurian. That selected as the holotype is a single lateral or kite-shaped plate, not quite perfect in outline, but sufficiently so to enable a comparison to be made with the other described forms, and especially with *T. mitchelli*, Eth. fil.,² from Bowning, N.S. Wales. This plate is preserved in a grey mudstone, and a ferruginous stain brings out the details of the surface ornament. The outline of the plate is ovate or leaf-shaped, and pointed at the apex, but the point is not so extended as in *T. scotica*, Eth. fil.,³ a difference also remarked by Mr. Etheridge in the case of the Bowning specimen.⁴ The line of the central fold is marked by a strong rounded keel, which

1 Mem. Geol. Surv. India, Pal. Ind., N.S. vol. ii., Mem. 3, 1906, p. 129, pl. vii., fig. 17.

2 Etheridge, R., jnr., "On the occurrence of the Genus *Turrilepas*, H. Woodw., and Annelid Jaws in the Upper Silurian (? Wenlock) Rocks of New South Wales." Geol. Mag., N.S., dec. iii., vol. vii., 1890, p. 338, pl. xi., figs. 1, 2, 4, 5.

3 Silurian Fossils of the Girvan District, vol. i., 1880, p. 214, pl. xiv., figs. 22-27 (cf. figs. 22-24).

4 Op. supra cit., p. 338.



proves that the internal surface of the plate is exposed.¹ The lateral, imbricating lamellae cross the plate from keel to margin in a wide sigmoidal curve, excepting near the marginal border, where they turn, with a sharp curve, towards the apex. Traces of fine, interrupted, radial striae cross the lamellar surfaces. This feature constitutes a distinctive character from that of *T. mitchelli*.

Dimensions of Holotype.—Length, 5.75 mm.; greatest breadth, 3.83 mm.

The second example of this species, here taken as a paratype, may be a median plate since it is of exceptional breadth. It is, however, of comparatively large size as compared with the median plates of other species. The lamellar ornament is well marked and the lateral upturned edges are seen to be distinctly undulate, especially on the convex side of the fold. This plate is exposed on the outer side, and the median fold is broad and distinct. On the concave side of the median fold there is another wide and shallow fold, which is feebly repeated on the opposite side. The radial striae are more distinct in this specimen, and are seen to extend over the area of the upturned portion of the lamellae.

Occurrence.—Type specimen from the grey mudstone of the Yan Yean Reservoir tunnel, near Whittlesea; coll. and presented by Mr. A. J. Shearsby, F.R.M.S. The (?) median plate, from the mudstone of South Yarra; coll. by Mr. F. P. Spry. Silurian (Melbournian).

Turrilepas yeringiae, sp. nov.

(Pl. XXVIII., Fig. 2).

Description.—Remains of five covering plates with their external surfaces exposed, arranged in a short conical group. Two (?) median plates rather shorter than the laterals, and not quite so sharply folded in the median line; in apposition. Lateral or kite-shaped plates more elongate and acuminate;

¹ For a description of the relationship of fold and keel, see F. R. C. Reed, "The Structure of *Turrilepas peachi* and its Allies." Trans. R. Soc. Edin., vol. xlv., pt. iii., No. 21, 1908, p. 520.

apex curved. Central fold stronger than in the median or triangular plates. In the median area of each lateral half, a minor and broader fold occurs. Imbricating lamellae closely set, sinuous, and somewhat unequally spaced at different parts of the same plate; this, however, may be due to a slight distortion of the surface. The lamellae crossing the plates nearly at right angles and when within the last third towards the margin, turn up sharply towards the apex.

Dimensions.—Length of entire group, 9.5 mm.; breadth, 7 mm. Length of a lateral plate, 7 mm.; breadth at base, cir. 3 mm. Length of median plate, cir. 3.66 mm.; breadth at base, cir. 2.33 mm.

Occurrence.—Silurian (Yeringian); coll. by Geol. Surv. Vict., B16, about $1\frac{1}{2}$ miles below Simmons' Bridge Hut on the Yarra (Upper Yarra Distr.). At another Yeringian locality, B23, G.S.V., at the junction of the Woori Yallock and Yarra, some separate plates of a *Turrilepas* occur. They are not very well preserved, but show a strong median fold like that in the above species.

Remarks.—This form differs from Etheridge's *T. mitchelli*¹ in the greater proportionate length of the plate, in the exceptional width of the median fold seen on the exterior of the plate, and in the sharply upturned outer edges of the lamellae. In outline, our species bears a marked resemblance to *T. scotica*, Eth. fil.,² but the plates in that species are wider at the base, and more extended and pointed at the apex.

Order—PHYLLOCARIDA (Pocl-shrimps).

Genus—*Ceratiocaris*, McCoy.

Ceratiocaris pinguis, sp. nov.

(Pl. XXVIII. Figs. 3-5).

Description of Holotype.—Carapace subovate, sides very tumid. Anterior margin straight, sloping downwards and back-

1 Op. supra cit., p. 338.

2 Mon. Sil. Foss. Girvan, 1880, pl. xiv. figs. 22-24

wards to meet the gently sinuous ventral margin at a moderately wide angle; dorsal border widely curved and sloping rapidly towards the back to meet the short posterior margin; the latter nearly straight or slightly concave, and sharply angled above and below.

Description of Young Forms.—These are more regularly ovoid, with stronger dorsal and ventral curvatures, and absence of angulation at the extremities. One of the examples shows the existence of a moderately broad ventral flange.

Dimensions of Holotype.—Length of carapace, 23.5 mm.; greatest height, 13 mm.; length of exposed abdominal series of segments, 11 mm. Average length of abdominal segments, cir. 3 mm.

Silurian (Melbournian). South Yarra; in mudstone. Found by Mr. P. Taverner.

Affinities.—This is a peculiar form of the genus on account of the inflated appearance of the carapace, and the highly curved dorsal line. There seems to be no very closely related form to this, the nearest being *Ceratiocaris cassioides*, T. R. Jones and H. Woodward,¹ a species found in the Lower Ludlow of Leintwardine, Shropshire, associated with small brachiopods and *Cardiola cornucopiae*.

Remarks.—Examples of the present species are very numerous in the grey and brown mudstone of South Yarra (Yarra Improvement Works), but are nearly all indifferently preserved. It was apparently gregarious in habit, since one slab of mudstone showed traces of nearly a score of individuals crowded together. The general appearance of the specimens is that of a swollen subovate carapace-cast, which is almost invariably stained with carbonaceous material. In the type-specimen there is a circular elevation of the matrix on the upper anterior area of the carapace, suggestive of an ocular spot; but since several of the earlier described so-called ocular-bearing phyllocarids, owing to illusionary cavities and fragments of matrix, have now turned out to be really referable to *Ceratiocaris*, it necessitates great care in their interpretation. Should an

¹ Mon. Brit. Palaeozoic Phyllopoda, Pal. Soc., 1888, p. 59, pl. iii., fig. 9; pl. iv., fig. 7 pl. vii., figs. 4-6.

ocular spot be demonstrable in this form it would require to be removed to the genus *Emmelozoe*; but this genus, by the way, has hitherto furnished no evidence of appendages to the carapace.

CERATIOCARIS cf. PARDOEANA, J. and W. (Plate XXVIII., fig. 6).

C. ("*pardoensis*") *pardoeana*, La Touche (nom. emend. T.R.J. and H.W.), Jones and Woodward, 1888, Mon. Brit. Pal. Phyll., pt. i., p. 30, pl. v., figs. 1, 2.

Description.—An imperfect example of a carapace, wanting the anterior region, and with two abdominal segments, occurs in the mudstone of South Yarra. It is closely allied to the above species, if not identical with it. The dorsal margin is nearly straight, with not quite the decided curvature of *C. pardoeana*; the ventral margin is truncated anteriorly, and sharply rounded posteriorly. There is a large amount of variation in the English examples of *C. pardoeana* from the Lower Ludlow, which helps to make our comparison better founded. The two abdominal segments, as in *C. pardoeana*, are broad and short.

Dimensions.—Approximate length of carapace when complete, 28 mm. Greatest height, 19 mm. Height of first abdominal segment, cir. 14 mm.; length, 5 mm.

Occurrence.—Silurian (Melbournian). In bluish mudstone; South Yarra. Coll. by F. P. Spry.

Genus—*Xiphidiocaris*, J. M. Clarke.

Note.—The phyllocarid genus *Xiphocaris* was published by Prof. Rupert Jones and Dr. H. Woodward in 1886. The name was preoccupied, however, by a genus of the *Palaemonidae* (prawns), published by Martens in 1872. In Zittel's Text Book of Palaeontology (Engl., ed. by Eastman, 1900), at p. 655, Prof. J. M. Clarke makes the following reference:—"Xiphidiocaris, Jones and Woodw. (emend.)." The altered name must therefore stand as above.

Xiphidiocaris falcata, sp. nov.

(Pl. XXVIII., Figs. 7, 7a-d).

Description.—Telson slender, incurved, widely sickle-shaped, gradually tapering from the broad, flattened proximal end to the bluntly-pointed distal extremity. Edges nearly smooth; a few remnants of small spines present on the concave or inner border. Surface (side) bearing a subcentral ridge, at first flat at proximal end, contracting to a strong ridge passing obliquely towards the outer border, where it persists to the apex. So far as can be seen, the surface was relieved by an imbricated, scaly ornament near the base, whilst the distal surface bore series of pittings parallel with the inner side. Surface also marked with fine longitudinal striae, especially on the outer side of the ridge of the convex border, where they become oblique. In cross section the form would be subrhomboidal, with flattened sides and broad grooves along the outer and inner borders.

Dimensions.—Length of telson, 58 mm.; width at proximal end, 9 mm.; width at 20 mm. from base, 5 mm.; width at 50 mm. from base, 2.25 mm.

Occurrence.—Silurian (Melbournian). In the blue mudstone of South Yarra. Coll. F. P. Spry.

Remarks.—The originally described examples of this genus were found in the Lower Ludlow of Shropshire. The only species hitherto known is *X. ensis*, Salter sp.,¹ a form distinguished from ours by the wider curvature of the telson, the more regularly ovate section, and the conspicuous and regular serration of the edges. The surface pits visible in the English examples are interpreted by Messrs. Jones and Woodward as the bases of spines; a character also seen in the telsons of *Ceratiocaris*, to which genus this imperfectly understood form seems allied.

¹ See *Xiphocaris ensis*, Salter sp. Jones and Woodward, Mon. Brit. Pal. Phyllopoda, Pal. Soc., 1888, p. 62, pl. v., figs. 7a-d.

EXPLANATION OF PLATES.

PLATE XXVII.

Fig. 1a,b.—Tube and cast of burrow of *Trachyderma crassituba*, sp. nov.: 1a, upper portion showing the circular contour of the burrow where vertical to the bedding; 1b, continuation of same burrow, less part of specimen at gap, showing, by section(s) the compressed outline where nearly horizontal with plane of bedding. 1b is turned through 180 deg. to show the burrow on the same plane as 1a, but which is in reality on the relatively opposite face in regard to 1a, the slab having been fractured through to the underside of the specimen. Holotype. Silurian (Melbournian). S. Yarra. Coll. by F. P. Spry. Nat. size.

Fig. 2.—*T. crassituba*, sp. nov., in hard dark grey mudstone. Paratype. Silurian (Melbournian). Between Hoyte's Paddock and Punt Road, South Yarra. Coll. by F. P. Spry. Nat. size.

Fig. 3.—*T. crassituba*, sp. nov. A specimen showing the outer, corrugated surface of the tube. Paratype. Silurian (Melbournian). S. Yarra. Coll. by F. P. Spry. Nat. size.

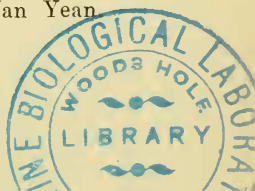
Fig. 4.—*Trachyderma* cf. *crassituba*, sp. nov. Specimen oblique to plane of bedding, showing cast only. Silurian (Melbournian). S. Yarra; between Hoyte's Paddock and Punt Road. Coll. by F. P. Spry. Nat. size.

Fig. 5.—*Trachyderma* cf. *squamosa*, Phillips. Cast of burrow, oblique to the bedding plane. Silurian (Yeringian). Junction of Woori Yallock and Yarra. Coll. Geol. Surv. Vict. B23.

N.B.—All figures on this plate of the natural size. *s* = transverse section.

PLATE XXVIII.

Fig. 1.—*Turrilepas ornatus*, sp. nov. Holotype. Inner surface of plate. Silurian (Melbournian). Yan Yean. Coll. by A. J. Shearsby. $\times 6$.



- Fig. 2.—*Turrilepas yeringiae*, sp. nov. Holotype. Portion of individual, comprising five plates; outer surface exposed. Silurian (Yeringian). Junction of Woori Yallock and Yarra. Coll. Geol. Surv. Vict. $\times 6$.
- Fig. 3.—*Ceratiocaris pinguis*, sp. nov. Holotype. Cast of carapace and five abdominal segments. Silurian (Melbournian). S. Yarra. Coll. by P. Taverner. Nat. size.
- Fig. 4.—*C. pinguis*, sp. nov. Cast of carapace and part of abdominal segment of an immature specimen, having a more ovoid body and vestige of a ventral flange. Silurian (Melbournian). S. Yarra. Coll. by P. Taverner. Nat. size.
- Fig. 5.—*C. pinguis*, sp. nov. Cast of carapace and abdominal segment of a young, rotund-shaped individual. Silurian (Melbournian). S. Yarra. Coll. by P. Taverner. Nat. size.
- Fig. 6.—*Ceratiocaris* cf. *pardoeana*, Jones and Woodward. Portion of carapace and two abdominal segments. Silurian (Melbournian). S. Yarra. Coll. by F. P. Spry. Nat. size.
- Fig. 7a-d.—*Xiphidiocaris falcata*, sp. nov. Telson. Nat. size. *a*, *b*, sections showing superficial contour at two places, $\times 2$; *c*, surface enlarged, $\times 2$; *d*, outline at apex, showing serrated concave margin and an apical pit, $\times 3$. Silurian (Melbournian). S. Yarra. Coll. by F. P. Spry.

PLATE XXIX.

- Fig. 1.—Cast of worm burrow of *Trachyderma crassituba*, sp. nov., showing the rounded base. (A mould of *Nuculites maccoyianus* on the same slab). In mudstone. Silurian (Melbournian). S. Yarra. Coll. by F. P. Spry. Two-thirds nat. size.
- Fig. 2.—*Turrilepas ornatus*, sp. nov. External surface of (?) median plate. Silurian (Melbournian). S. Yarra. Coll. by F. P. Spry. $\times 6$.